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Effect of methyl jasmonate on growth characteristics and accumulation of phenolic compounds in suspension culture of tartary buckwheat

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Abstract

© 2015, Pleiades Publishing, Ltd. The effect of methyl jasmonate (MeJA) was studied at concentrations of 0.01, 0.1, 1, and 10 μM on the following physiological and biochemical characteristics of the suspension culture of tartary buckwheat (Fagopyrum tataricum (L.) Gaertn.): growth, morphogenesis, the content of phenolic compounds (PC), and antioxidant activity (AOA). Qualitative and quantitative HPLC analysis of PC revealed that the dark-grown suspension culture of tartary buckwheat synthesizes rutin, quercitrin, epicatechin, ferulic and p-coumaric acids, with rutin being the most abundant component. It was shown that MeJA had no inhibitory effect on growth of suspension culture and stimulated the formation of PC, especially in media supplemented with 1 and 10 μM MeJA. At increasing concentrations of MeJA, the accumulation of PC was accompanied by the decline in AOA, which was probably due to the development of oxidative stress in the suspension culture. MeJA at a concentration of 10 μM stimulated slightly the growth of biomass; however, after the passage in the medium with 10 μM MeJA, the suspension culture almost lost its ability to form embryoids on the hormone-free medium. Cultivation of cells in the medium supplemented with 10 μM MeJA not only elevated the total content of PC but also modified their qualitative composition and the content of individual PC. The epicatechin content was higher than in the control culture throughout the whole passage; the increase in the content of p-coumaric acid and rutin was noted between the 4th and 8th days, and quercitrin content increased on the 8–14th day. Synthesis of these compounds was activated not by the end of the passage, as it occurred in the control culture, but at earlier stages of culture growth. The intracellular level of ferulic acid increased sharply on the 4th day of cultivation, while control cultures contained only trace quantities of this substance. It was found that MeJA activated biosynthesis of individual PC to different extents: the accumulation of epicatechin, p-coumaric and ferulic acids was more significant than that of rutin and quercitrin. In addition to the peaks of identified PC, MeJA stimulated the appearance of new compounds that were absent or weakly evident in the control culture.

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Keywords

antioxidant activity, Fagopyrum tataricum, methyl jasmonate, morphogenic ability, phenolic compounds, suspension culture